

## Teacher's Guide

### Grade 5: Mixtures and Solutions



**TEKS 5.5 Matter and Energy:** The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to:

**C)** demonstrate that some mixtures maintain physical properties of their ingredients such as iron filing and sand;

**D)** identify changes that can occur in the physical properties of the ingredients of solutions such as dissolving salt in water or adding lemon juice to water.



**Background Information:** This unit reinforces the concept that matter has observable and measurable physical properties that can be used to determine how matter can be classified, changed and used.

In this unit, students are presented with various examples of mixtures. They observe and learn that some mixtures maintain the physical properties of their ingredients, such as when iron filings are mixed with sand. They also identify changes that occur in the physical properties of the ingredients of special mixtures called solutions, such as when salt dissolves in water or when lemon juice is dissolved in water. Students also learn to differentiate between homogeneous and heterogeneous mixtures.

Students observe that knowledge of physical properties can be used to help separate the ingredients of mixtures, using tools such as a magnet or a filter, and techniques such as heating, until the liquid part of the mixture evaporates.



**Prerequisite Knowledge:** Prior to this year, students have learned that all objects are made of matter and have physical properties. They know the physical properties of objects include color, shape, size, texture, mass, weight, and temperature. They also know that these properties can be observed using their senses. By now, students have investigated combining different materials and that when put together, these materials can do things that they cannot do by themselves such as building a tower or a bridge. Through these investigations, students are able to justify the selection of

materials based on their physical properties.

Students have explored and can recognize that a mixture is created when two materials are combined such as gravel and sand and metal and plastic paper clips. They should be able to compare and contrast a variety of mixtures and solutions such as rocks in sand, sand in water, or sugar in water.



**Common Misconceptions:** Students may struggle with understanding solutions. A solution is a special type of mixture that is formed when a substance dissolves in water or another liquid. The substance that dissolves in the liquid may be a solid, or it can be another liquid. Sometimes all or just some of the physical properties of the ingredients of a solution may change.

Students tend to think that substances such as milk or chocolate, that are uniform in color and consistency, are “pure” substances when they are actually mixtures.

Students may also incorrectly believe that when a substance dissolves, it disappears. When a solid (solute) dissolves in a liquid (solvent), the solid particles fill the spaces between the liquid particles. The small particles of matter that make up the solid are still present, however they are so small they are not visible.



**Essential Questions:**

1. How can the substances of a mixture be separated based on properties?

*A substance can be separated based on size, shape, color, and ability to attract to a magnet. These physical properties do not change when substances are in a mixture.*

2. What would be the best method for separating the salt from the liquid in a sample of ocean water?

*In order to separate or extract the salt from the solution, the ocean water would need to be heated. Heating a solution of ocean water in a glass container on a hotplate will cause the water to turn to steam and eventually evaporate, leaving only the salt crystals behind.*

**3.** How do the physical properties of ingredients change when they are combined in a solution, such as when salt dissolves in water?

*When a solid dissolves in a liquid, some of the physical properties of both substances change. For example, when salt dissolves in water, the salt particles become invisible and the taste of the water changes. When a colored, powdered drink mix is dissolved in water, the color of the water and the taste of the water change. The solid particles of drink mix can no longer be seen. The same is true when lemon juice dissolves in water. The lemon juice cannot be seen and the water smells and tastes like lemon.*

**4.** In a mixture of water, sand, salt, gravel and iron filings, which ingredients will maintain all of their physical properties after being mixed together?

*The sand, gravel, and iron filings will maintain their physical properties. The salt will dissolve in the water, resulting in changes in the physical properties of both ingredients. The shape and size of the salt crystals will change and the water will become salty.*



**Notes:**